METHOD FOR PRODUCTION OF GLASS MATERIAL FROM ASH-SLAG WASTE

The invention pertains to the building materials, more concrete – to the method of glass materials obtaining from ash-slag waste which can be widely used in chemical, radio-electronic and other fields of industry as well.

A method of glass materials obtaining from ash – slag waste, consists that batch of the following composition, wt. %: CaO 9.0-54.0, SiO_2 13.0-75.0, Al_2O_3 5.0-26.0, carbon 1.0-2.0, Fe_2O_3 1-24, MgO 2.0- 6.0, Na_2O 0.1-1.0, K_2O 0.2-1.0, SO_3 0.1-0.6, TiO_2 0.2 is heated in a melt temperature and melted in regain medium. The result fusion is cooled by thermal shock to the point of glass material formation (Pre –print of Physics Institute, Academy of Science USSR N74, 1991, Siberia Department, Krasnojarsk. Pavlov V.F at al. "Conversion technology of KATEK's aches").

The given method allows practically from all known ash-slag waste to obtain glass materials with relatively low coefficient of thermal conductivity what permits their wide using as a heat insulating materials.

However, it is impossible to carry out the full transitional metals combinations. It significantly decreases the application field of obtained glass materials because using them as raw material for obtaining of the optical transparent glass materials is impossible.

The purpose of the invention is the development of such methods of glass material obtain from ash-slag waste which will significantly improve to quality of materials obtain and would wide their application field owing to full batch purification from admixture of transition metals combinations.

It is decided so that in the method of glass material obtaining from ash-slag waste the batch of the following composition, wt. %: CaO 9.0-54.0, SiO_2 13.0-75.0, Al_2O_3 5.0-26.0, carbon 1.0-2.0, Fe_2O_3 1-24, MgO 2.0- 6.0, Na_2O 0.1-1.0, K_2O 0.2-1.0, SO_3 0.1-0.6, TiO_2 0.2 is heated to melt temperature and melted in a reducing medium.

The obtained melt is cooled by thermal shock to the glass material forming. Before batch heating the carbon content to 3-8 wt .% is brought. The formation of glass material structure is carried out in an adjusted formation flow of gas medium. In the causes that it is necessary to obtain the glass material with a maximum porosity (using it as a heat insulating

material), due to the dissociation of carbides in the water it would be formed by gases in the gas medium.

In the causes when it is necessary to obtain a glass material with a spherical form – finding a wide using in different fields of industry from chemical (as a filters) to aircraft (as a light–weight and heat isolation material), it needs a gas medium would be formed by additional given inert gas.

It is possible the gas medium would be constitute a mixture of additional given inert gas and gases due to the decomposition of carbides in water.

It will allow obtaining gas material with the maximum porosity from ash-slag waste with a small content of aluminum and calcium oxides.

For obtaining of the silicate bricks, the facing plates using in the building industry, the obtained glass material is profitable to grind additionally and to press with a following burning.

The obtained material can be additionally heated to the melt formation and then cooled slowly.

It allows to obtain wear-resistant glass ceramic materials.

For obtaining of optical material with a wide transmission bend and high transparency coefficient in the visible and infrared ranges. The obtained material is necessary to heat additionally to the melt formation and then to cool with the following burning.

The best versions of invention fulfillment.

The purposed method of glass material obtaining from an ash-slag waste lies in the fact that the batch of the following composition, wt. %: CaO 9.0-54.0, SiO_2 13.0-75.0, Al_2O_3 5.0-26.0, carbon 1.0-2.0, Fe_2O_3 1-24, MgO 2.0- 6.0, Na_2O 0.1-1.0, K_2O 0.2-1.0, SO_3 0.1-0.6, TiO_2 0.2 0.1-1.0 is heated to the melt temperature and melted in a reducing medium.

The obtained melt is cooled by thermal shock with simultaneous formation of glass material structure in an adjusted flow of gas medium.

In the ash-slag waste the carbon content usually does not exceed 5.0 wt. %.

It's not enough for full process of iron oxides reduction and formation of carbides. That's why the carbon content in the batch is made up to 3.0-8.0 wt. % for carrying out of a straight process of from oxides reduction before heating of batch.

The given quantitative carbon interval is stipulated by percentage content of iron oxides in the starting ash-slag waste.

For obtain of a given structure of glass material of this method are used the gases generated by the composition of carbides, inert gases or a mixture of them.

Below the proposed method of glass, material obtaining from ash-slag waste is explained by specific examples.

♦ First example: 500gr of ash-slag waste obtained from coals burning of composition, wt. %: CaO 24, SiO2 54, 57 Al2O3 9.43 carbon 1 Fe2O3 6.0, MgO 4.0, Na2O 0.31, K2O 0.36, SO3 0.13, TiO_2 0.2 melting in graphite crucible at temperature 1,350- 1,450 degrees during 2.5 hours. The carbon content is brought to 3.0 wt. % before heating of batch. The obtained melt with iron common content 0.15 wt. is cooled in the heat-shock regime by pouring in water. In this case, the momentary foaming of glass material takes place. The obtained porous glass material is granulated to needed milling fineness and for pores strengthening the material is burned to 850 degrees and then cooled. The produced glass material is caricaturized by poured density of 150 kg/m^3.

♦ Second example: 500gr of ash-slag waste obtained from coals burning of composition, wt. %: CaO 32.2, SiO2 42.5, Al2O3 5.0 carbon 2.0 Fe2O3 12.0, MgO 4.5, Na2O 1.0, K2O 0.4, SO3 0.2, TiO2 0.2 melting in graphite crucible at temperature 1,350- 1,450 degrees during 2.5 hours. The carbon content is brought to 3.0 wt. % before heating of batch. The obtained melt with iron common content 0.15 wt. is cooled in the heat-shock regime by pouring in water. In this case, the momentary foaming of glass material takes place. The obtained porous glass material is granulated and thermal treated by the method mentioned in the first example. The produced glass material is characterized by poured density 150 kg /m^3.

♦ Third example: 500 gr of ash-slag waste obtained from coals burning of composition, mass % CaO 13.1, SiO2 38, Al2O3 19.2, carbon 2.0, Fe2O3 20.0, MgO 6.0,Na2O 0.2, k2O 0.9, SO3 0.4, TiO2 0.2. The carbon content is brought to 8.0 wt. % before heating of batch. Then the batch is melting in graphite crucible at temperature 1,350-1,450 degrees during 2.5 hours.

♦ The obtained melt with iron common content 0.15 wt is cooled in the heat-shock regime by pouring in water. In this case, the momentary foaming of glass material takes place. The obtained porous glass material is thermal treated as second

example. The produced glass material is characterized by poured density 150 kg /m^3.

◆ Fourth example: 500 gr of ash composition mentioned in the first example is melted and thermo- treated as in the first example. The obtained material is dispersed to grain dimensions of 0-80 μm. The cubes of 100x100x100 mm and sticks of 40x40x160 mm are pressed to the powder. The mould product is dried and then burned to 950 degrees during 30 min with the following cooling in the furnace. The obtained samples are characterized with the following properties:

The compressive strength, MPa 39.3.

The bending strength, MPa 7.7.

◆ Fifth example: 500 gr of ash composition mentioned and melted as in the fourth example. The obtained melt is cooled in thermal shock regime by pouring method of rising blow of inert gas (CO2) as a result the obtained glass material has a hollow spherical shape with density of grains 1000 kg/m^3 .

◆ Sixth example: 500gr of ash composition mentioned and melted as in the fourth example. The obtained melt is cooled in thermal shock regime by pouring in water with a blowing of inert gas (CO2) as a result more 50% of obtain glass material has the follow spherical shape of different diameters with grains density of 500 kg/m^3.

◆ Seventh example: 500gr of ash composition mentioned and melted as in the fourth example. The obtained melt is cooled in thermal shock regime by pouring the melt in water through the framed material. As a result of lesser 50% of common mass of obtained material have a hollow spherical shape of different diameters with density of grains 100-300kg/m^3.

The invention can most effectively be used for building materials production for different purposes (brick, heat and sound isolation, facing and ceramic materials, filtering and chemical resistant materials).

Furthermore, the proposed method allows to obtain a glass material with a high transmission coefficient which is used in magnet – optics (magnet –optical memory disks, liquid-crystalline light modulators, in astro-optics as well .